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ABSTRACT

This scope and sequence guide, developed for an air conditioning, heating, and refrigeration vocational education program, represents an initial step in the development of a systemwide articulated curriculum sequence for all vocational programs within the Metropolitan Nashville Public School System. It was developed as a result of needs expressed by teachers, parents, and the business community for sequential structure within the vocational education curriculum. The guide contains an introduction, course description, general course objectives, course content (with specific objectives) in outline format, and a list of resource materials, such as textbooks, curriculum guides, and audiovisual aids. This course is designed to prepare students for employment in the air conditioning, refrigeration, and heating industry; to provide students with the skills and knowledge necessary to install, service, plan, and estimate types of air conditioning, refrigeration, and heating systems; and to develop manipulative skills relevant to the trade. The course provides students with opportunities to participate in Vocational Industrial Clubs of America (VICA) leadership training, and in local, state, and national skills competition. (KC)

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# AIR CONDITIONING HEATING, AND REFRIGERATION

## SCOPE AND SEQUENCE

VOCATIONAL EDUCATION

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**Metropolitan Public Schools**

**Nashville Davidson County, Tennessee**

**Charles O. Frazier, Director**

## FOREWORD

This scope and sequence guide, developed for the Air Conditioning, Heating, and Refrigeration Vocational Education program, represents an initial step in the development of a systemwide articulated curriculum sequence for all vocational programs within the Metropolitan Nashville Public School System. It is a direct result of needs expressed by teachers, parents, and the business community for sequential structure within the vocational education curriculum. An articulated vocational curriculum allows a student to move from one level of instruction to the next without repeating learning tasks already mastered, and without experiencing gaps in the presentation of relevant instructional material.

A goal of this curriculum effort is to provide teachers a usable guide based on input from the teachers. The initial step was an identification of course content, with all teachers having an opportunity to contribute. What follows is a publication using the teachers' contributions: a sequential listing of objectives and skills for each program offering.

This guide does not include all specific resource materials that may be used to assist students in acquiring minimum competencies. It is to serve as a guide for the sequence of course content and scope of what is to be taught. This guide content is extremely important and its use is encouraged. The suggested competencies and resource materials allow instructors an opportunity to be creative and resourceful in meeting the needs of individual programs and students.

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The Committee:

| Instructors | Schools |
|---|---|
| Johnny R. Orman, Jr. | Glencliff |

Committee Coordinator: Preliminary and Revision Committees- Roy P. Angel-McGavock

Program Area: Forrest P. Wilson, Coordinator

Editorial Consultant/Design/Layout

Judy Beier - Commerical Art Instructor - Maplewood
Mary Jo Grady - Commercial Art Instructor - Pearl/Cohn
Joy Binkley - Editing
Dr. Jim Lorenz - Third Party Evaluator
Exemplary Project Staff
Vocational Program Coordinators

Printing/Binding/Typesetting/Technical Assistance

Sam White - Printing Instructor - Overton
Jesse Ray - Printing Instructor - Whites Creek
Cleve Yokely - Printing Instructor - Stratford
Kenneth Ford - Manager - Metropolitan Public School Binding
Robert Tucker - Director - Metropolitan Public School Printing Department
Jean Porter - Publications Specialist - Department of Communication and Community Relations
Debbie Fulghum - Typesetter - Department of Communication and Community Relations

## INTRODUCTION

This guide is designed to provide continuity for the course of study in Air Conditioning, Heating, and Refrigeration. Units of study are suggested for each level; however, each concept can be taught in connection with many other units. This is a flexible guide and each teacher is encouraged to stay within the six-weeks scope. Emphasis should always be placed on basics as well as modern concepts.

It is hoped this guide will serve as a framework for Air Conditioning, Heating, and Refrigeration instructors in preparing the instructional program within their local schools. However, each instructor is urged to use his/her creative effort to adapt and expand these guidelines to serve the individual needs of students.

## COURSE DESCRIPTION

This course is designed to prepare the student for employment in the air conditioning, refrigeration and heating industry; to provide the student with the skills and knowledge necessary to install, service, plan and estimate types of air conditioning, refrigeration and heating systems. Also, manipulative skills relevant to the trade are taught.

Students have the opportunity to participate in Vocational Industrial Clubs of America (VICA) leadership training and in local, state and national skills competition.

## GENERAL COURSE OBJECTIVES

1. To teach safety procedures in the field of climate control
2. To teach the proper care and use of tools and equipment used in climate control occupations
3. To teach basic skills for entry into the air conditioning and refrigeration field
4. To make students aware of the diversified skills used in the climate control industry

## COURSE CONTENT FOR AIR CONDITIONING, HEATING, AND REFRIGERATION I

(First Semester)

I. **Introduction to refrigeration (6 weeks)**

Specific objectives:

To become acquainted with safety precautions that must be followed
To become acquainted with job opportunities and necessary requirements

A. Learns safety

B. Studies occupational opportunities

C. Studies manpower requirements

II. **System components (6 weeks)**

Specific objectives:

To become acquainted with all system components and their operation
To perform actual hands-on projects

A. Understands matter and heat balance

B. Understands fluids and pressure

C. Understands compression cycle components

D. Understands fundamentals of system components

E. Fabricates projects

III. **Refrigeration technician tools (6 weeks)**

Specific objectives:

To become acquainted with the technical tools of the trade and their use
To perform hands-on problems

A. Learns types of hand tools

B. Utilizes refrigeration measuring and testing equipment

C. Solves problems

## COURSE CONTENT FOR AIR CONDITIONING, HEATING, AND REFRIGERATION I

(Second Semester)

I. **Control devices (6 weeks)**

Specific objectives:

To understand the function and operation of all control devices
To be able to identify all control devices

A. Understands meter devices

B. Adjusts T.E.V.

C. Understands capillary tubes

II. **Understanding service (6 weeks)**

Specific objectives:

To learn correct service procedures
To learn proper installation of equipment

A. Troubleshoots problems

B. Installs equipment

C. Starts-up equipment

D. Practices general observation

III. **Service (6 weeks)**

Specific objectives:

To learn the proper procedure for drawing up all types of contracts
To learn proper customer relationship

A. Explains figures used in contracts

B. Prepares service contracts

C. Studies customer relationship

## COURSE CONTENT FOR AIR CONDITIONING, HEATING, AND REFRIGERATION II

(First Semester)

I. **Safety (6 weeks)**

Specific objectives:

To review all aspects of safety related to climate control
To develop a thorough understanding of all safety codes

A. Understands codes and ordinances

B. Understands cooling safety

C. Understands heating safety

D. Understands mechanical and electrical safety

II. **Load circulation (6 weeks)**

Specific objective:

To become acquainted with proper electrical installation requirements

A. Understands residential and commercial B.T.U. needs

B. Understands heat load - proper sizing

C. Understands building requirements

D. Understands control installation

E. Understands power source - pneumatic, electronic

III. **Residential air distribution (6 weeks)**

Specific objective:

To gain hands-on experience in the installation of residential air conditioning

A. Determines air velocity

B. Determines specifications

III. **Residential air distribution continued:**

C. Determines sizing of duct

D. Troubleshoots air problems

E. Determines filtration - electronic and mechanical

## COURSE CONTENT FOR AIR CONDITIONING, HEATING, AND REFRIGERATION II

(Second Semester)

I. **Air conditioning trouble shooting (6 weeks)**

Specific objective:

To understand how to diagnose and repair all types of air conditioning systems

A. Troubleshoots and repairs electrical systems

B. Troubleshoots and repairs mechanical systems

C. Troubleshoots and repairs shop projects

II. **Analysis service (6 weeks)**

Specific objective:

To become acquainted with all aspects of service analysis

A. Analyzes heating service

B. Analyzes A/C cooling service

C. Analyzes commercial refrigeration service

III. **Preparation for work (6 weeks)**

Specific objectives:

To gain a thorough understanding of job requirements and expectations
To prepare for postsecondary training

A. Reviews job application

B. Performs general shop work

C. Reviews postsecondary training programs

COURSE CONTENT FOR AIR CONDITIONING, HEATINIG, AND REFRIGERATION

III

(First Semester)

I. **Safety (6 weeks)**

A. Understands in-depth study of National Safety Code

B. Understands B-9 code

II. **Load calculation (6 weeks)**

A. Calculates actual heat load of residential refrigeration

B. Calculates actual load of commercial refrigeration

III. **Air distribution (6 weeks)**

A. Services noise in system

B. Services diffusers

C. Services air cleaners

## COURSE CONTENT FOR AIR CONDITIONING, HEATING, AND REFRIGERATION

### III

(Second Semester)

I. **Job attainment (6 weeks)**

- A. Studies expectations of installer
- B. Studies expectations of service man
- C. Studies expectations of a helper

II. **General maintenance (6 weeks)**

- A. Performs routine inspection of electrical equipment
- B. Performs inspection of mechanical equipment
- C. Performs inspection of controls

III. **Preparation of entry in field (6 weeks)**

- A. Participates in on-the-job interview
- B. Visits supply house
- C. Visits prospective shop

## RESOURCE MATERIALS

### Textbooks


Althouse, Andrew. Modern Refrigeration & Air Conditioning, 3rd Edition. Goodheart-Wilcox Publishing, 1979.

Miller, Rex. Refrigeration & Air Conditioning Technology, 1st Edition. Bennett Publishing Company, 1983.


### Curriculum Guides


Lang, V. Paul. Principles of Air Conditioning, 3rd Edition. Delmar Publishing, 1982.

Stoecker, W. F. Refrigeration & Air Conditioning. McGraw-Hill Publishing, 1982.

Trane Reciprocating Refrigeration, 46th Edition. Trane Company, Publisher, 1977.

Wantiez, Gary W. V-Teck. Stillwater, Oklahoma: Mid-American Vocational Curriculum Consortium Inc., 1977.

Whirlpool Training Manual, 3rd Edition. Whirlpool, Publisher, 1976.


### Audio Visual


Johnson Training, Pneumatic Control Service Training, Johnson Control Company, Publisher, 1979

Principles of Electricity, Series 25, Kit 755. Moreland-Latchford, Publisher, 1977

Refrigeration Instrumentation, Series 39, Kit 760. Moreland-Latchford, Publisher

Refrigeration Service Fundamentals, 3rd Edition, Kit 708, D.C.A. Publisher, 1977

Refrigeration Training Program, Kit 297, D.C.A. Publisher, 1978